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The Role of Public–Private Partnerships in Promoting Smallholder Access to Livestock Markets in Developing Countries

Methodology and Case Studies

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ABSTRACT

Rising demands for quality and safety measures in high-value agriculture and livestock markets have necessitated the creation of increasingly complex supply chains to manage the flow of goods and information among channel actors. Public–private partnerships (PPPs) can play a key role in strengthening links within the supply chain, particularly where market failures impede access by the poor. This paper examines the potential of PPPs in promoting smallholder access to such supply chains. A conceptual model is presented that highlights the need to generate chain-level benefits for all channel participants in order for PPPs to be sustainable and to adequately address market failures. A case of both a successful and a failed PPP in livestock markets illustrates the utility of this model.

Keywords: public–private partnerships, supply chain, high-value agriculture

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1. INTRODUCTION

In recent years, global agriculture has been transformed from being primarily supply-driven to being driven by consumer demands for quality, food safety, convenience, and choice. This change has been fueled by the rapid consolidation of global retail chains and the development of supermarkets in developing countries (Regmi and Gelhar 2005; Weatherspoon and Reardon 2003). This transition of agriculture from staple commodities to high-value agricultural (HVA) products clearly has wide-ranging implications for producers in developing countries. While HVA goods, such as horticultural and livestock products, tend to be highly perishable and more susceptible to food safety problems, they also command higher prices than traditional staples in many markets. Poor producers in many developing countries are often drawn to the financial lure of producing these goods without understanding the difficulties associated with their delivery to distant markets.

The complexity of HVA necessitates a predominant role for supply chain management in the delivery of HVA products. The establishment of efficient supply chains requires the creation of relationships, networks, skills, and coordination mechanisms to manage the flow of products between intermediaries and to ensure that quality specifications are met. In most cases involving HVA, the private sector has facilitated the establishment of networks, often sourcing from large farmers who may or may not contract out to smaller firms (Dolan and Humphrey 2000). Consequently, small-scale producers are often left out of the process, due to their low productive capacity, remote location, and limited competitiveness with larger growers. Organizational challenges further impede private-sector inclusion of smallholders. Although the public sector has traditionally provided services such as extension, research, infrastructure, and marketing outlets to smallholders, the movement toward a demand-driven agriculture, rather than one focused on productivity and output, limits the ability of governments to fully assist smallholders in the manner demanded by the marketplace.

In the face of these market failures and externalities, public–private partnerships (PPPs) can play a key role in strengthening and enhancing links within the supply chain, particularly for small producers who may otherwise be limited in their ability to participate in innovative supply chains (Boselie, Henson, and Wetherspoon 2003; Hartwich, Janssen, and Tola 2003). While the potential for PPPs in supply chains has been noted in past research (Boselie, Henson, and Wetherspoon 2003; Hartwich, Janssen, and Tola 2003; Hartwich, Gonzalez, and Vieira 2005; Duffy and Fearne 2004), the literature does not examine how or where PPPs can be introduced into the supply chain. In particular, the literature has not systematically examined potential entry points for PPPs within the supply chain that could facilitate smallholder access and improve the management of the supply chain. This suggests that a deeper knowledge of supply chains is required to understand the means by which PPPs can improve the management of relationships within the supply chain in ways that integrate the poor and reduce market failures.

In this paper, we assess the role of PPPs as a mechanism for enhancing the involvement of the poor in HVA supply chains. We first introduce concepts about supply chains and their importance in the delivery of HVA. We then highlight the market failures in different parts of the supply chain that can limit smallholder access to HVA channels. Using the supply chain management framework as a guide in our analysis, we review the traditional roles of public and private sectors in the supply chain and the challenges brought forth by HVA. We then discuss the potential of PPPs as a means of overcoming these challenges and provide a conceptual model that defines requirements for successful intervention by PPPs in HVA supply chains. This model is illustrated with the help of two case studies of livestock products in developing countries. A discussion of future directions for PPPs in supply chain management concludes the paper.

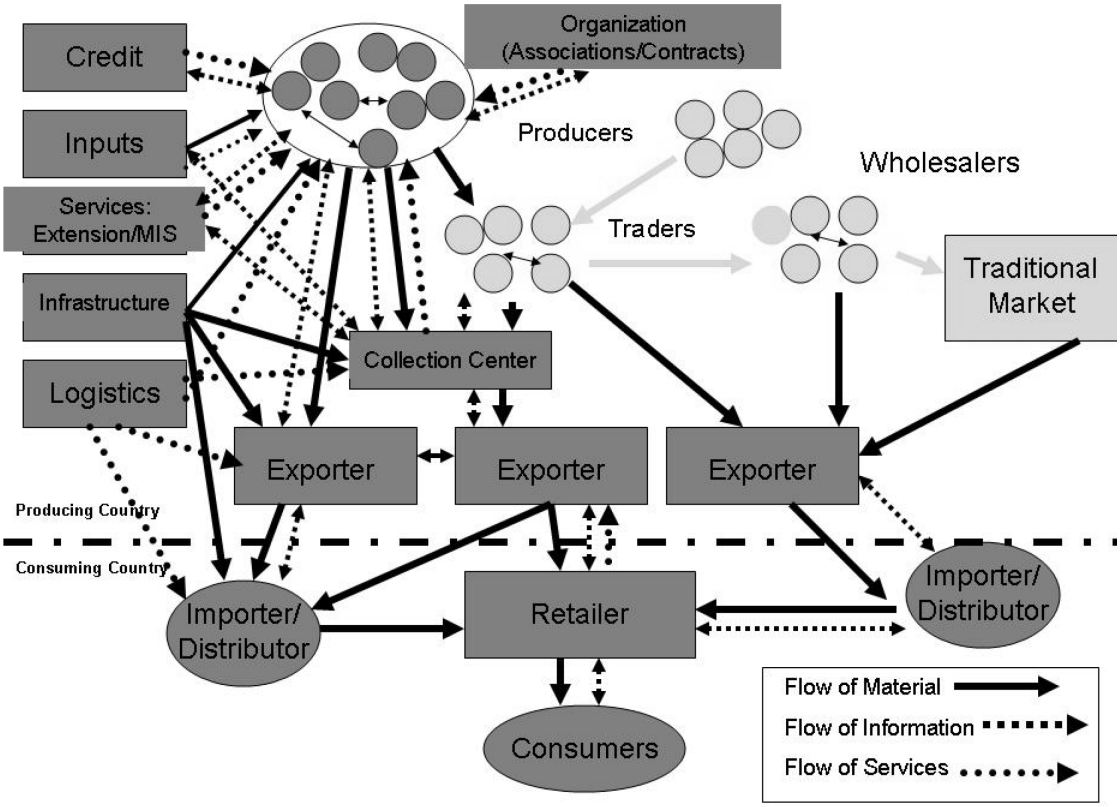
2. CHARACTERISTICS OF THE HVA SUPPLY CHAIN AND ITS MANAGEMENT

A supply chain can be generically defined as the entire range of activities involved in the production of a commodity, good, or service (McGarvey and Hannon 2004). These activities include the physical movement of products from raw materials to finished goods, the gathering of demand and order information, the logistical activities to support the procurement and information needs of the supply chain, the financial activities that generate revenues and finance operational aspects, and the transfer of technology among supply chain actors (McGarvey and Hannon 2004; van Roekel et al. 2000). HVA supply chains incorporate numerous actors associated with the marketing, distribution, finance, support, and retail of agricultural commodities. The complexity of agricultural supply chains has increased, despite the fact that in many cases they have become shorter, as buyers seek to increase efficiencies and reduce costs associated with intermediaries (Humphrey 2005).

Supply chains can be thought of as networks comprised of both horizontal and vertical linkages (Lambert and Cooper 2000) and may transcend national boundaries (Kaplinsky and Morris 2001)[1]. Figure 1 illustrates hypothetical supply chains for a high-value, nonprocessed agricultural commodity and distinguishes between modern markets (here, those that are exported to foreign retailers) and traditional supply chains. In some cases, traditional and modern supply chains will overlap, for instance when modern supply chains rely on traditional channels to obtain any shortfall of goods from their own channel. Three types of "flow" can be distinguished within the supply chain: flow of material, services, and information. Flow of material often requires sophisticated logistics or infrastructure in modern supply chains, such as storage facilities or cold chains, which are lacking in traditional channels. Flow of services among chain actors is important because it supports chain processes and ensures that participants can meet specifications. Flow of information communicates characteristics related to quality, food safety, and consumer demand. Note that information flows are transmitted in both directions. Breakdowns in information among actors can lead to inefficiencies in the supply chain. An example of this is the "bullwhip effect," whereby information gaps among actors can lead to variability in production and inventories that is greater for actors upstream in the supply chain (Lee, Padmanabhan, and Whang 1997). Modern supply chains contrast with traditional supply chains in that the flows of services and information are quite complex and play an important coordinating role among actors. The organization of supply chain actors thus plays an important role.

[1] While we focus our attention on supply chains in this paper, we would argue that these perspectives would apply equally to value chains as found in the development literature (Kaplinsky and Morris 2001). Indeed, the value chain literature tends to distinguish between supply and value chains, with the latter argued to encompass a broader range of stakeholders, relationships, and so forth and the former more oriented toward logistics. However, we would argue that supply chains, as explicated in the modern management literature discussed in this section, are essentially synonymous with the concept of value chains as presented in the development literature, particularly with respect to issues of coordination, chain linkages, and relationships.

Figure 1. A high-value agriculture supply chain



Source: Developed by the authors.
Note: MIS stands for Management Information Systems.

Supply chain management refers to the process of managing, designing, transforming, and optimizing the flow of materials, processes, information, and services in the supply chain in a manner that adds value for its stakeholders (Lambert and Cooper 2000; Spekman, Kamauff, and Myhr 1998). Supply chain management is thus more than just logistics. Rather, it requires the development of mechanisms and linkages that coordinate stakeholders in terms of information sharing, production processes, standards, innovation activities, product development, and other business activities (van Roekel et al. 2000). A supply chain approach entails moving from a strategy applied at a firm level to one that incorporates the interdependencies among supply chain actors to meet consumer demand. Consequently, mechanisms are needed that support and manage these interdependencies effectively, since the successful performance of the chain requires that members act in a coordinated manner.

Van Roekel et al. (2000) argue that supply chains create value through these types of integrated relationships in three ways. First, supply chains expand the scope of markets beyond what individual members could achieve on their own. Second, supply chains achieve economies of scale in terms of cost savings, thus raising profits for chain actors. Finally, supply chains can better segment markets and offer a wider range of goods on the basis of such differentiation. Matanda and Schroder (2002) remark that supply chains in horticulture can play an important role in stabilizing prices and volumes, given the perishability of such products. Woods (2004) notes that supply chains can reinforce the competitive advantage of a group of firms by reducing risks for chain participants, reinforcing cooperation, and serving as a source of mutual innovation. Successful supply (or value) chains are thus able to leverage their relationships to produce and sustain higher rents for all chain actors.

The potential benefits to smallholders participating in successful supply chains are numerous. In the context of agricultural supply chains, van Roekel et al. (2000) note that producers gain from increased knowledge, higher quality and safer food, reduced costs and losses, higher sales, and greater value added in production. Consequently, consumers in particular benefit from safer, higher-quality, and lower-priced products. The development of supply chains can lead to access to new markets and opportunities for smallholders. For example, the rise of supermarkets in Africa and Latin America has opened new opportunities for producers, particularly in horticultural products (Weatherspoon and Reardon 2003).

At the same time, there are risks to producers involved in supply chains. Matanda and Schroder (2002) comment that supply chains that are tightly coordinated can actually increase uncertainty if there are "flow balancing problems" among channel participants. Benefits may not be equitably distributed, with larger farmers often gaining much more than smallholders. In the context of agriculture, there have been instances in which power asymmetries between producers and retail buyers have worked to the detriment of small producers who cannot meet retail standards for quality or produce in consistent volumes (Dolan and Humphrey 2000). Kaplinsky and Morris (2001) remark that there are risks in engaging in supply chains in which there is the potential for "immiserizing growth" that reduces the returns to activities over time. This suggests that it is crucial that the entry point into supply chains for producers enables them to upgrade their position within the supply chain.

3. MARKET FAILURES LIMITING SMALLHOLDER INVOLVEMENT IN HVA SUPPLY CHAINS

A salient feature of many HVA supply chains is the multiplicity of potential actors among upstream producers and traders with whom processors and retailers must coordinate and establish production platforms. In many cases, there is a bias in such activities toward larger farmers that have the scale, income, and technical expertise to meet demanding buyer specifications (Dolan and Humphrey 2000). Market failures present in an economy can further exacerbate these constraints against smallholders.

We can identify several types of interrelated market failures and associated transaction costs that smallholders face in accessing HVA supply chains. First, actors in the supply chain may experience information asymmetries and high transaction costs. Small- and medium-scale producers may not participate in growing markets for HVA commodities because they may have difficulty guaranteeing that the products they produce meet mandated food safety and quality requirements. Because of information asymmetries, both the producer and the consumer may have limited knowledge of the food safety problems associated with the inputs they use in production or of problems that may occur in the processing and delivery of the product as it proceeds through the supply chain. Problems can arise from the quality of inputs or their misuse or from the growth and transport of microbial pathogens and mycotoxins; these problems can be magnified as products move along the supply chain. Moreover, the supply chain in many developing countries is often characterized by anonymous transactions in spot markets, implying limited communication and coordination among farmers, traders, and consumers. This lack of coordination, coupled with poor infrastructure and insufficient cold storage systems, creates an environment in which market participants have little incentive to reduce microbial pathogens, mycotoxins, and pesticide residues (Narrod et al. 2005).

Such market failures make it difficult for many developing countries to conduct traceability programs for product differentiation or food safety. To implement standards, it is necessary to establish processes to control for food hazards or specifications throughout the whole supply chain. Though private institutions aligned with supermarkets are beginning to provide technical assistance to their suppliers to ensure the delivery of products with certain safety standards to high-end markets, it is not clear if the private supply of traceability meets or falls below socially desirable levels. Moreover, while this mechanism may be in place for the suppliers of products going to specific markets, the majority of the agricultural production in developing countries still remains in the hands of poor households which are not necessarily aligned to multinational supply chains and may not receive the type of technical assistance needed to ensure that their suppliers meet a certain level of standards.

Coordinated systems provide the potential to ensure that certain measures are met by the suppliers of specific products, allowing food to be traced back to suppliers if food-borne disease outbreaks occur. While it may be possible to trace a product when the supply chain actors are known, at least two situations may result in inadequate standards in infrastructure. As noted by Busby and Mitchell et al. (2006), the first situation arises from the public goods nature of these standards, which can lead to a free-rider problem and an underinvestment in the provision of infrastructure. The second situation is coordination failure, in which asymmetric incentives lead participants to pursue investments that are suboptimal for the industry as a whole. Relying on the private sector to deliver information may not lead to an efficient outcome, particularly when a country may be trying to obtain a disease- or pest-free status or establish traceability capabilities and certification schemes.

Delgado, Narrod, and Tiongco (2008) further suggest that transaction cost barriers hinder smallholder participation in markets. Transaction costs are the costs of exchange that arise from asymmetries in access to information and assets across market actors. If both buyers and sellers can easily ascertain the quality of the item being sold and the prices in alternative markets at the time of sale, there are no asymmetries in information and the transaction costs of exchange are low. However, if buyers cannot be sure of the true quality of the good they are purchasing, they will be less willing to pay a premium for it based on claimed quality.

Transaction costs are especially prevalent in the livestock product business and clearly play a role in the displacement of smallholders, as markets become more demanding in terms of information about the quality of the product at the time of sale. Delgado, Narrod, and Tiongco (2008) give two examples of transaction costs involving livestock producers that concern the safety of inputs and outputs. In the first case, because information about purchased inputs, such as feeds in developing countries, is often unreliable, larger producers often assure feed quality by mixing their own feeds. In the Philippines, large-scale hog producers mix their own feed because poor quality feeds produce off-flavors that can only be detected upon consumption of the final product. In doing so, these large producers receive higher prices per unit than small-scale producers by developing a steady clientele that has confidence in the safety and quality of the product originating from this group (Costales et al. 2003).

A second case study reveals that smallholders have difficulties selling milk outside the local market because purchasers in anonymous markets cannot be sure without a bacteriological test that the milk is safe. By contrast, large-scale producers and cooperatives of small-scale producers may be able to establish trust and reputation in markets. This situation occurs in the Indian dairy industry where such groups depend on repeat sales to the same clients who can identify the source of the milk (Delgado, Narrod, and Tiongco 2008; Sharma et al. 2003).

An additional reason for the exclusion of smallholders from many forms of agricultural production in developing countries is that they cannot compete with the larger operations which benefit from technical and allocative economies of scale. Organizational constraints can further dampen the participation of smallholders in HVA supply chains. In addition to facing information asymmetries and transaction costs in exchange, smallholders themselves, because of their small scale, may not be able to perform many of the actions necessary to be incorporated in HVA supply chains, such as quality control, handling, and storage (Bienabe and Sautier 2005). Where smallholders can participate in HVA supply chains, they often lack the ability to upgrade to or adopt innovative marketing activities; they are constrained by limited bargaining power that reduces the benefits of their participation and their ability to market products directly (Kaplinsky and Morris 2001). The development of horizontal linkages through farm associations or cooperatives is one means by which producers can effectively scale up production and engender better access to more modern supply chains. Bienabe and Sautier (2005) note that producer organizations serve more than just coordinating roles: they also bring members financial benefits and increased capacity, information, and advocacy vis-à-vis other supply chain actors. At the same time, they remark that these forms of organization are themselves subject to transaction costs in organization, as it can be difficult to communicate the benefits of group organization and coordinate smallholders along such lines. Free-rider problems in horizontally linked groups can become especially acute.

Finally, regulatory failures are a significant aspect of developing countries and contribute to the underdevelopment of supply chains themselves. Government overregulation, taxes, or tariffs can raise the cost of supply chain development and lower the benefits of participation for all members. Limits or bans on foreign investment may make it impossible for foreign participants to enter a market and bring needed technical expertise and coordination activities to a potential supply chain. While the private sector can compensate (and often has) for government underregulation in the form of standards or certification programs by creating private standards, this often leads to smallholders being left out of HVA channels (Reardon et al. 2001). Even when regulatory norms are appropriate, changes in consumer demand can have negative impacts on smallholders if retailer sourcing decisions change in response (Humphrey 2005).

At the same time, it is true that many of the adverse circumstances facing smallholders could be attributed to "bad luck," happenstance, or isolation from markets. Smallholders may not be competitive by virtue of high unit costs that are exacerbated by small landholdings and/or distance to markets. However, while such problems may not be considered market failures as such, there may be important institutional and regulatory subtexts behind those issues that themselves are market failures. For instance, while limited competitiveness related to small landholdings is not per se a market failure, if land tenure rights are absent or credit markets are imperfect, then the ability of smallholders to engage in HVA is constrained by implicit contextual market failures that themselves needed remedying.

Historically, the public sector has been responsible for finding remedies to market failures. However, the ability of the public sector in developing countries to establish standards and provide the needed infrastructure, institutions, and monitoring capabilities throughout the supply chain is limited. The absence or malfunctioning of strong public support institutions, such as agricultural extension, rural banks, input providers, or market information services, further thwart the public sector's capabilities. Firms sometimes try to assume these roles in the absence of strong public support. Through private hierarchy, alliances, strategic interaction, third-party certification efforts, and collective association, firms often profit from the resolution of market failure. Occasionally, the existence of a market failure benefits firms; therefore, there is no incentive to correct it. More frequently, however, the market failure costs the firm in terms of reduced sales or added costs. In such cases, firms have an incentive, either alone or in aggregate, to correct the market failure, although their efforts are not likely to reach small-scale producers that are not suppliers to their supply chain. Relying on the private sector to correct the market failure may thus result in a suboptimal correction of the market failure if the private costs and benefits of implementing controls are not the same as the social costs and benefits. Resolving these public good and coordination failures often requires intervention from an organization outside of industry or government.

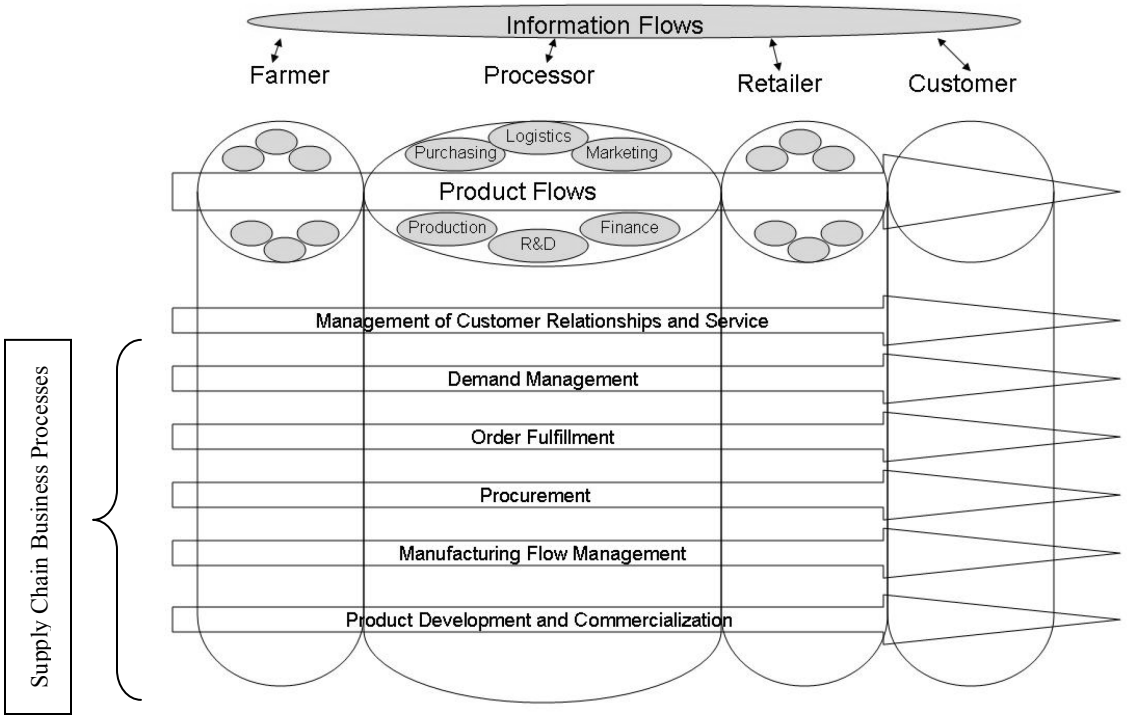
The market failures described above suggest a role for specific interventions by the public sector, the private sector, or a combination of both. Indeed, because supply chain management requires the coordination of actors and activities (that is, "chain solutions"), the most appropriate interventions for ensuring that market failure corrections are equitable and reach smallholders may be those that combine public intervention in one portion of the supply chain and private participation in another. PPPs that rely on the strength of each sector to deliver certain functions along the supply chain may result in the optimal correction of market failures and the meeting of societal objectives.

4. INSTITUTIONS AND SUPPLY CHAIN MANAGEMENT: TRADITIONAL ROLES AND CHALLENGES OF HVA

In this section, we discuss the traditional roles of different institutions involved in managing particular aspects of the supply chain. This section serves as a precursor to the development of a methodology that demonstrates how PPPs in supply chains can coordinate public and private actors in chain-level interventions for poverty alleviation, given that the market failures and challenges presented in HVA supply chains may require a more integrative approach.

The complexity of supply chains implies that there are many possible entry points for both public and private intervention. As a point of synthesis and further elaboration, it is useful to delineate the activities undertaken in a supply chain more rigorously and explicitly in order to understand and define the potential roles for public and private institutions. Our starting point is the supply chain model of Cooper, Lambert, and Pagh (1997), which highlights the networks of activities and processes in the supply chain. Each actor in the supply chain will carry out a number of different internal activities (of varying degrees of importance, depending on the actor), including production, purchase of inputs, logistics, marketing and sales, financial management, and research and development. Along the supply chain itself, there will also exist a number of important processes that supply each firm's activities and integrate actors along the supply chain. These processes include managing customer relationships and demand, fulfilling orders, procuring materials, and engaging in chain-level research and development (R&D) and marketing. Figure 2 illustrates this model in a diagram and shows how supply chain processes link different participants in the supply chain, while revealing the main internal competencies undertaken at the firm level.

Figure 2. Activities and processes involved in supply chain management



Source: Adapted from Cooper, Lambert, and Pagh 1997.

While agricultural supply chains differ from manufacturing supply chains, they nonetheless share many of the same types of activities and processes. We adapt this framework to identify the activities (Table 1) and processes (Table 2) that play a predominant role in HVA supply chains in developing countries. We maintain the internal activities: production, input purchases, logistics, marketing, credit (finance in Figure 2), and technological development. Key processes that support these internal activities include extension services (related to product development and commercialization in Figure 2), infrastructure development (such as storage facilities, related to issues of manufacturing flow management), information systems (akin to order fulfillment and demand management), and certification, grades, and standards (related to demand management and customer service management). An additional process not explicitly shown in Figure 2 is the organizational mechanisms that coordinate supply chain actors at key points in the supply chain and provide information about supply chain specifications, such as contracts and other forms of vertical and horizontal coordination (Bienabe and Sautier 2005). Table 1 and 2 highlight the traditional roles played by different public and private institutions in each of these activities and processes. We further indicate the challenges that HVA supply chains impose on these functions.

Table 1. Institutional roles in the supply chain management of high-value agriculture: Activities

Supply chain activity	**Traditional institutional roles**		**Needed roles for SCM**	**Market failures**	**Possible entry point for PPPs and NGOs**
	Public sector	**Private sector**			
Production	Input and output price policies; regulation of competition	Generic commodity and final product production	Production of high-value, specialized commodities and goods that meet rigid customer specifications	Producer scale, limited technical skills in new techniques, low farmer income, poor price incentives	Link farmers with public support agencies and private sector buyers using NGOs as a facilitator/partner
Input procurement	Input and output price policies; regulation of competition	Purchases of inputs for production	Use of high-quality inputs that meet customer specifications for end-products.	High taxes/subsidies, lack of credit access for inputs	Creation of producer organizations to procure high-quality inputs in bulk to reduce costs
Logistics	Public distribution of commodities	Specialized logistics functions to manage distribution activities	Cost-reduction activities to reduce transaction costs in distribution	Poor infrastructure, crowding out by public sector, low market access for remote areas	Development of partnerships to link distribution activities in remote communities
Marketing	Public certification; promotion of orphan crops	Development of brands and labels; commodity promotion and retail activities	Coordination of production system to institutionalize product differentiation and market segmentation branding strategies for adding value	Limited smallholders' capacity in formal marketing and branding strategies; limited smallholder capacity to meet specifications of brands	Use of producer organizations or NGOs to establish marketing partnerships with processors and retailers to promote innovative or socially beneficial products and create brands

Table 1. Continued

Supply chain activity	Traditional institutional roles		Needed roles for SCM	Market failures	Possible entry point for PPPs and NGOs
	Public sector	Private sector			
Credit	Public-sector banks, credit subsidies	Private-sector banks, microfinance activities, informal credit (moneylenders)	Access to credit to purchase high-quality inputs and finance	Smallholders' access to credit limited by high transaction costs and rationing in credit provision	Provision of microcredit by NGOs and village leaders, in conjunction with underwriting by public and private sector lenders
Research and development	Public R&D and production for seeds, inputs, varieties; input price policies	Private R&D and production for seeds, inputs, varieties	Development of new technologies to raise productivity of high-demand commodities	Private profitability of varieties with social benefits may be low or negative	Research partnerships to develop socially beneficial inputs to production

Source: Developed by the authors.
Notes: SCM is supply chain management, PPP is public–private partnerships, and NGOs are nongovernmental organizations

Table 2. Institutional roles in the supply chain management of high-value agriculture: Support processes

Supply chain support processes	Traditional institutional role		Needed roles for SCM	Market failures	Possible entry point for PPPs and NGOs
	Public sector	Private sector			
Extension services	Technical assistance to producers in farming practices	Provision of services to farmers and firms linked to private company	Knowledge of specialized techniques for high-value products	Variable smallholder access to public or private extension; limited public knowledge of new techniques; under-funding of services	Creation of partnerships to leverage public and private delivery of specific types of extension services (training, field schools, vaccinations, etc.)
Infrastructure development	Public infrastructure (roads, ports, storage facilities); public distribution of commodities	Private infrastructure (processing, storage); logistics and information services	Manage flows between chain links quickly and efficiently to meet rigid deadlines by buyers; reduce distribution costs to remain competitive with other supply chains	High transportation costs, low access to smallholder areas, poor infrastructure, erratic information flows, crowding out by public sector	Partnerships between public sector and producer groups/NGOs to jointly finance and maintain roads, storage facilities, etc.

Table 2. Continued

Supply chain support processes	Traditional institutional role		Needed roles for SCM	Market failures	Possible entry point for PPPs and NGOs
	Public sector	Private sector			
Information services	Provision of public statistics on prices, production, etc.; provision of information on varieties through extension	Use of private marketing information services (MIS) and electronic data interchange (EDI)	Integrate information flows across supply chain actors	Imperfect information by smallholders on needs of buyers and customers in HVA	Development of MIS to integrate government statistics agencies with private producer associations, use of IT to distribute market information
Certification, grades, and standards	Public certification of seeds and varieties; development and enforcement of public standards and regulations; food safety inspection and monitoring	Private certification of seeds and varieties, development and enforcement of private standards; enforcement of ISO standards	Consistent, credible application of rigid standards on food safety and quality specifications to meet buyer and customer demands	Smallholders' ability to meet public or private standards limited; divergence between public and private standards; low capacity to enforce public standards	Creation of third-party certification agencies that manage quality and food safety in conjunction with government and producer groups
Coordination mechanisms	Creation and enforcement of regulations to ensure competition and market exchanges; mandatory cooperatives (centrally-planned economies)	Development of contracts, alliances, and marketing agreements with suppliers	Mechanisms must ensure consistent delivery of high-quality products	Limited enforcement of contracts; divergence in market power between chain actors	Third-party PPP to underwrite and monitor contracts; development and promotion of producer associations to improve enforcement.

Source: Developed by the authors.
Notes: SCM is supply chain management, PPP is public–private partnerships, NGOs are nongovernmental organizations, HVA is high-value agriculture, and ISO is International Organization for Standardization.

For supply chain activities, the public sector has traditionally provided regulatory and support measures. Production and procurement activities have been facilitated (or, in many cases, taxed) by input and output price policies. In some cases, state-owned enterprises have played (and sometimes still play) a prominent role in downstream processing and marketing activities, often to the detriment of the private sector. The public sector has had a large role in research, information, and extension activities, though the effectiveness and financing of such activities have been waning. Moreover, many of the techniques fostered under traditional public extension and research are not directed toward production of specialized high-value commodities; information resources are biased toward low-value, staple products. Likewise, while many regulations are in place to support HVA supply chains, particularly in terms of certification, food safety standards, and monitoring activities, enforcement is often lacking, while regulations are not credible to either producers or buyers. Combined, traditional public functions are increasingly unable to

meet the array of standards demanded by HVA supply chains; thus, smallholders are disadvantaged in the process.

The private sector has traditionally been directly involved in the production, marketing, and distribution of agricultural commodities, with the rise in HVA commodities giving an ever larger and more specific role to private actors. At the same time, the attributes of HVA, in terms of specialized production, knowledge, and capacity, lead private-sector actors away from smallholders and toward larger farmers who can more easily meet the rigid standards and food safety requirements of foreign buyers. This is reinforced by the need to develop organizational modalities (contracts, for example) that link supply chain participants. While private-sector actors may wish to diversify their sourcing activities and procure from a mix of farmers, including smallholders, the income, credit, and resource constraints of smallholders present a challenge to the private sector. In particular, the creation of horizontal linkages to scale up producers through producer organizations presents difficulties to the public and private sectors alike.

The difficulties and challenges faced in new HVA supply chains imply that there may be potential synergies in partnering the roles of the public and private sectors to develop innovative solutions for smallholder participation. In particular, the development of supply chains and effective supply chain management in HVA necessitates a host of coordinating and integrating mechanisms that neither private nor public entities may be able to provide on their own. In Tables 1 and 2, we also illustrate the potential role of PPPs in the activities of an HVA supply chain. Possible areas of PPP involvement include the organization of producer associations for marketing and credit, development of public–private research consortiums for disseminating new varieties, brokerage of linkages between smallholders and processors, and creation of third-party certification and monitoring groups, all with a combination of public and private resources.

The general argument for PPPs rests on the idea that partnering allows actors to pool resources and risk regarding investments in research and innovations to achieve mutual benefits in ways that would not be possible without the partnership (Hartwich, Gonzalez, and Vieira 2005). In the presence of market failures where some sort of intervention is required, PPPs often have an advantage over pure public intervention in that they bring forth the best aspects of private-sector involvement (namely, an orientation toward efficiency and optimal resource use) with the social welfare aspects of the public sector (Spielman and von Grebmer 2003). The market failures that prevent smallholders from accessing HVA supply chains may not be resolved through private-sector intervention alone. Humphrey (2005) cites a number of advantages held by smallholders in HVA supply chains, including the desire of buyers to diversify supply sources, restrictions or transaction costs with other suppliers, and locational advantages. However, as noted previously, the private sector also faces large transaction costs in developing a supply base, particularly in upgrading farm capacity, which may work against the large-scale integration of smallholders. Likewise, public-sector interventions to integrate smallholders into HVA supply chains may not be sufficiently targeted to meet the specialized demands of HVA buyers. Traditional public-sector activities such as extension, research and development, and price and marketing policies have been largely commodity-based and may not provide the support that smallholders require in an HVA supply chain. By contrast, a partnering approach between the public and private sectors in HVA chains potentially resolves these constraints by allowing jointly funded investments in groups (such as smallholders) that may otherwise be excluded and that would benefit from participating in HVA supply chains. In the next section, we discuss a framework to assess how PPPs can be incorporated into HVA supply chains.

5. A CONCEPTUAL MODEL OF PPPS IN HVA SUPPLY CHAINS

Given that PPPs could help resolve the market failures experienced by smallholders in accessing HVA supply chains, it is important to try to determine their potential entry points and requirements for their establishment. Tables 1 and 2 in the previous section enumerated a number of possible entry points for potential PPPs at discrete points in the supply chain. However, as noted by Spekman, Kamauff, and Myhr (1998), successful supply chain management requires "the entire supply chain moving in unison, sharing similar goals and objectives." The coordination of disparate actors and institutions through both horizontal and vertical linkages is required. We thus posit that the entry point for PPPs, particularly those that increase smallholder participation in the supply chain, does not necessarily stem from the creation of partnerships in discrete components of the supply chain (such as extension, credit, and marketing). Rather, it comes from the development of coordinated approaches at key bottlenecks in the supply chain that leverage the strengths of public- and private-sector intervention into chain-level solutions. In essence, a successful PPP would "coordinate coordination" to raise the efficiency of marketing channels that include smallholders. A PPP in one point of a specific supply chain could further organize and bring together public and private actors in other parts of the chain.

At the same time, the creation of PPPs entails considerable transaction costs of their own, in terms of coordination, information, communication, and other indirect costs (Hartwich, Gonzalez, and Tola 2005). Successful PPPs must induce benefits that outweigh the costs of organization. Hartwich, Gonzalez, and Tola (2005) provide three requirements that underpin the creation of a PPP: (1) the existence of common interests between public and private parties, (2) positive benefit-cost ratios to PPP participation for both the public and private sectors, and (3) the potential for the creation of synergies among public and private participants. However, given the coordination costs and chain-level synergies that must exist within a supply chain, we further posit that PPPs in HVA supply chains must provide additional benefits to the entire supply chain that exceed both the total costs of supply chain coordination *and* the costs of a potential public–private partnership. Moreover, while PPPs in discrete activities typically generate discrete benefits to the public or private actor, the benefits generated by a PPP in a supply chain must also derive from the success of the entire supply chain, in addition to any private benefits to the partners.

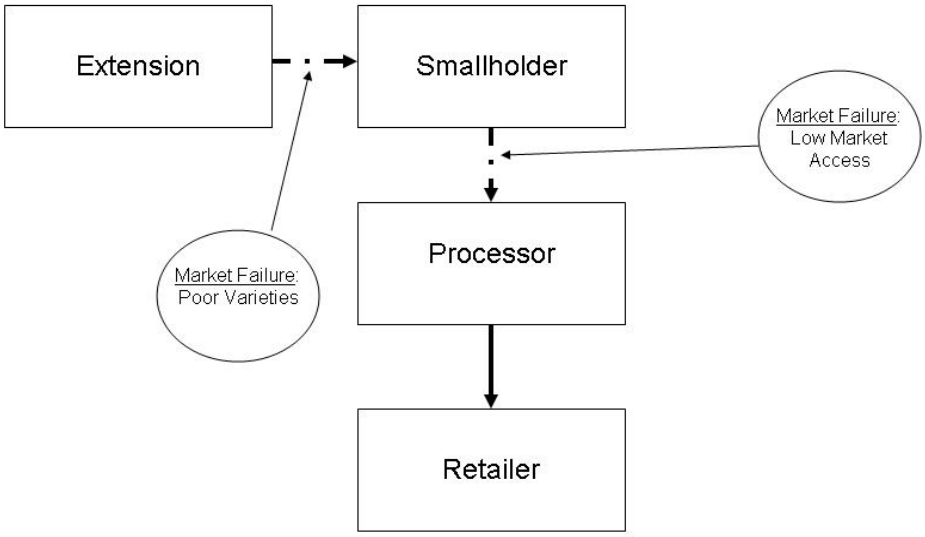
The preceding analysis allows us to suggest a conceptual framework for the role of PPPs in the integration of smallholders in HVA supply chains. For PPPs to induce the successful participation of smallholders in HVA supply chains, we hypothesize that the following four requirements must be satisfied:

1. The benefits to the targeted beneficiary (the smallholder) from the PPP must be greater than the costs associated with participation costs.
2. The benefits to public partners in the PPP must be greater than the public costs of partnering.
3. The overall net benefits to private partners in the PPP must be greater than the overall net private benefits of partnering without the PPP.
4. The benefits to the entire supply chain resulting from the PPP must be greater than the associated costs to the chain.

We illustrate this framework in Figures 3 and 4. In Figure 3, we map a simple HVA supply chain in which smallholders participate with three other actors—an extension agency, a processor, and a retailer. In Figure 3, we assume that market failures exist in the provision of high-quality varieties from extension services to smallholders and that there is limited market access from the farmgate to the processor (due to limited logistical capabilities and poor market information about downstream markets, for example). The dotted arrows connecting smallholders to extension services and processors indicate these market failures. In Figure 4, we illustrate two potential PPPs that attempt to correct the two market failures presented in this supply chain. These PPPs could include a research consortium to improve varieties sold to producers and a marketing organization that acts as a broker between farmers and

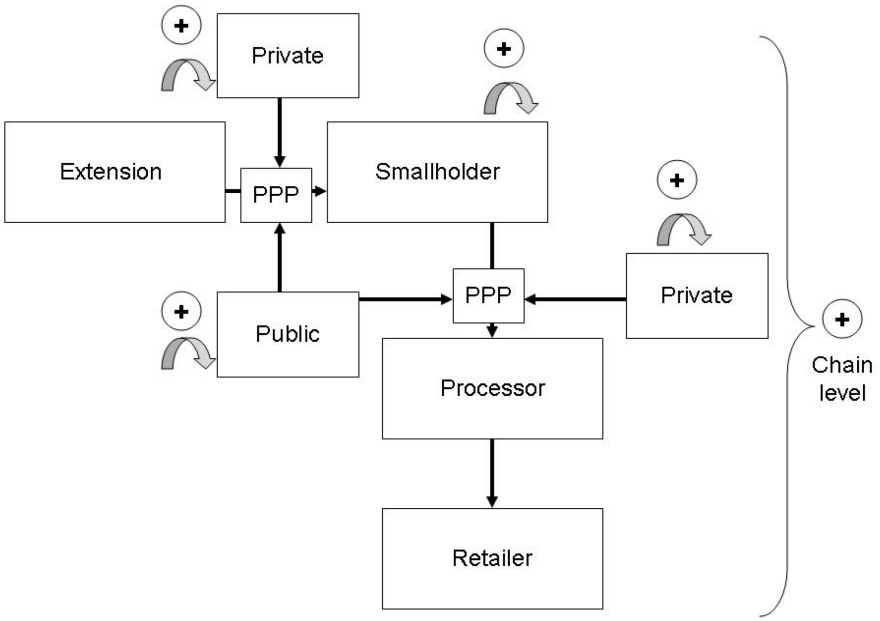
processors and is jointly funded by public and private funds. The success of these partnerships must induce positive benefits (represented by + signs) for each partner, the beneficiary (smallholder) targeted by the intervention, and the supply chain as a whole. Figure 4 highlights the need for partnerships at different points of the chain, based on both horizontal and vertical market failures, given the chain externalities that market failures at one point in the supply chain can induce. We should note that some market failures will necessitate a purely public or a purely private solution, depending on the relative benefits of each in correcting the market failure compared with a PPP.

Figure 3. Market failures in a simple supply chain



Source: Developed by the authors.

Figure 4. Contributions of PPPs in correcting market failures in supply chains



Source: Developed by the authors.
Note: PPPs are public–private partnerships.

The benefits to the entire supply chain (requirement 4) from a PPP depend largely on the dynamic and intrachain measures that are induced by a PPP. Successful PPPs in supply chains should generate positive chain externalities, such that the benefits to smallholders transmit positively to create benefits and investment incentives for downstream and upstream actors. Correspondingly, these will lead to benefits for the supply chain as a whole. Since interactions in a supply chain are dynamic, the benefits of an intervention may have effects (positive or negative) that are not immediately noticed; thus, the benefits of a PPP may occur with a lag as the effects of the PPP are transmitted to different actors over time. Hartwich, Gonzalez, and Tola (2005) further note that the benefits from a PPP depend on investments made by each actor in developing the partnership. If we extend this analysis to each member of the supply chain, noting the multiplicity of links among different actors in the supply chain and their effects on one another, this implies that the following, stated as our fifth requirement, is true:

5. The benefits to any supply chain participant at any period of time from a PPP-led intervention will depend both on the investments made by that participant in the supply chain that are induced by the PPP and on those taken by other actors in the supply chain that are directly linked with that participant.

We note that there could be differential sensitivity to PPP interventions depending on where in the supply chain such activities are undertaken, given that different supply chain participants may have more or fewer linkages than other supply chain actors (Rich, Winter-Nelson, and Brozovic 2005).

A study of the tea sector in Viet Nam (ADB 2004) illustrates the importance of these interchain externalities. In this supply chain, the fundamental constraint to the sector was the low quality of the tea, which prevented access to high-value domestic and international markets. Low quality in the tea sector arose from a number of sources: poor productivity of old tea plants, underuse and misuse of inputs, poor processing technology, and limited coordination in production and marketing within the supply chain. However, as correctly noted by the ADB (2004), interventions that focused on each constraint in isolation might not solve the key channel-wide constraint. For instance, improving productivity through PPPs in extension activities would not address the processing constraints downstream. While raising smallholder productivity would have a positive first-round effect, the net effect on the chain would be negative in the absence of other exogenous activities, since the intervention could exacerbate bottlenecks downstream in processing and exports that would result in a negative impact on the chain itself which, in turn, would reduce the benefits to smallholders and PPPs over time.

An important challenge will be to determine the best ways to integrate PPPs into chain-level activities that both resolve market failures and are responsive to consumer demand. A majority of PPPs in agriculture cited in the literature are in agricultural research activities (Spielman and von Gremer 2003). The dynamics and complexities of HVA supply chains necessitate the creation of innovative PPPs that generate linkages at different points in the supply chain (not just on varieties) to bring smallholders into markets in ways that are sustainable from the standpoint of income generation. This suggests that such partnerships will need to consider marketing and information activities, for example, as an important part of their portfolio in addition to traditional PPP interventions at the upstream level.

6. APPLICATIONS OF THE CONCEPTUAL PPP MODEL: CASE STUDIES OF SUCCESSFUL AND UNSUCCESSFUL PARTNERSHIPS IN LIVESTOCK MARKETS IN DEVELOPING COUNTRIES

Mother Dairy: A Way to Link Small-Scale Dairy Producers to Urban Markets[2]

The Mother Dairy project in India was implemented to link small-scale producers to consumers through the use of village cooperatives and the aid of the public sector in providing needed infrastructure. India's dairy industry has traditionally been dominated by the traditional unorganized sector that marketed their liquid milk to urban areas through milk vendors (*dudhias)* and sweet shops.

According to Sharma et al. (2003), the reasons for the persistence of a large traditional sector were twofold. First, Indian consumers were unwilling to pay the additional costs of pasteurization and packaging, which can raise retail prices by more than 100 percent. Second, consumers often regarded raw milk and traditional products obtained from reliable vendors as of better quality than formally processed dairy products. Correspondingly, small-scale dairy producers were caught in a situation of low returns, inaccessibility of resources and markets, and nonavailability of adequate production inputs and services.

The dependence on milk vendors was further aggravated by poor quality infrastructure. Moreover, these producers faced challenges in terms of information asymmetries, organization failures, and transaction costs. Their distance from the market thwarted their ability to obtain knowledge about the uniformity, consistency, and safety measures demanded by the urban market. Farmers further relied on a series of intermediaries who obtained a large share of the profit in the supply chain.

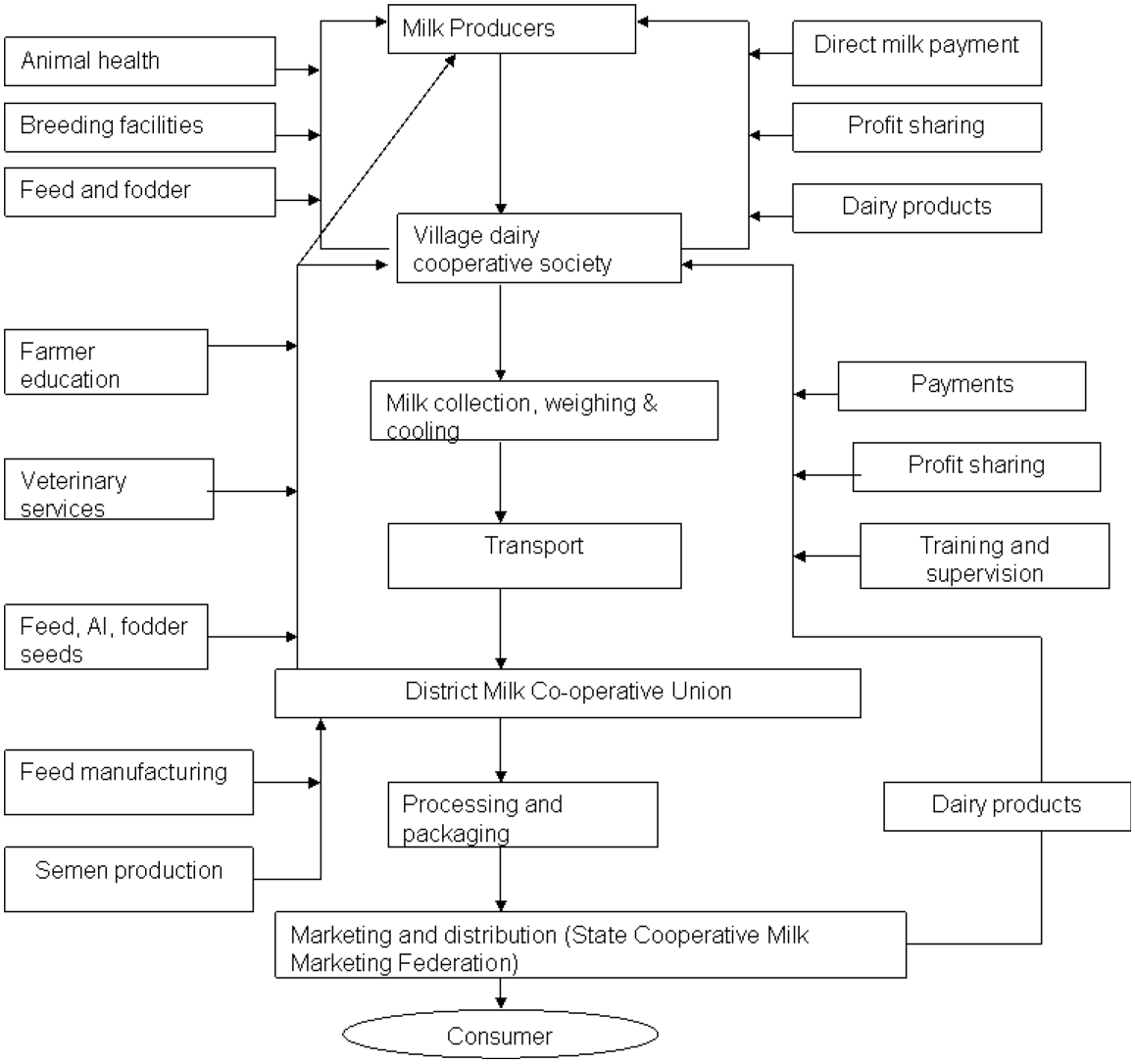
Over the years, the government has tried to alter the situation and distribute dairy products to urban consumers. In 1959, the government-funded Delhi Milk Scheme adopted a method of departmental milk procurement from the milk-producing areas around Delhi through the establishment of its own milk collection and chilling centers. Though the collection was initially started with small milk vendors, big contractors were ultimately created who purchased milk from small vendors and supplied it in bulk to the milk scheme. By the late 1960s, the government changed its strategy to focus its dairy development efforts on producers' cooperatives and milk production based on milk sheds in rural areas, modeled on the successful experience of the Kaira District Cooperative Milk Producers' Union, better known as Amul or the "Anand Pattern."

The Mother Dairy Supply Chain Structure

In 1971, the Government of India launched a massive dairy development program known as Operation Flood, which was built on the Amul success. The Anand Pattern is a three-tiered structure in which farmers organize themselves into dairy cooperative societies at the village level. These village-level cooperatives are further organized into district-level unions, which are federated into a state-level cooperative organization (Figure 5). Under this program, rural producers were organized into cooperatives so they would have an assured market, remunerative prices, and inputs and services for milk production enhancement, such as better feed and fodder, breed improvement through artificial insemination, and disease control measures. At the national level, the National Cooperative Dairy Federation of India coordinated the efforts of all state-level cooperative dairy federations.

[2] This description of the Mother Dairy Project is summarized from the report written by Sharma et al. 2003.

Figure 5. Activities and organization of the Mother Dairy milk cooperative



Source: Sharma et al. 2003.
Note: AI stands for artificial insemination.

Growth of the Mother Dairy Procurement Process

Since the 1970s, the Mother Dairy approach has expanded. It is presently a large, integrated cooperative structure that procures, processes, distributes, and markets dairy products to urban consumers. As of December 2002, about 101,000 dairy cooperative societies had been organized, involving about 11.2 million farmers. With the support of professional management, producers decide on their own business policies, adopt modern production and marketing techniques, and receive services that they could neither afford nor manage individually. The institutional infrastructure—village cooperatives, dairy and cattle feed plants, state and national marketing—is still owned and controlled by farmers, and the state provides the infrastructure to market the products in urban areas. As a result, the milk-processing capacity in the country has increased substantially, rising from 10,000–20,000 liters per day in the 1950s to 100,000 liters per day in the 1970s, 500,000 liters per day in the 1980s, and more than 1 million liters per day in the 1990s.

Market Failures that Have Been Addressed and Those Remaining

The Mother Dairy approach has succeeded in correcting the market failures of asymmetric information, organization failures, and high transaction costs for farmers who market their produce through village cooperatives. Looking at our model, the three-tiered structure of the cooperative system served to induce partnerships at different points in the supply chain in which such market failures were present. These joint efforts further ensured that the benefits of such partnerships exceeded their organization costs. At the same time, further research is needed to determine the scope of Mother Dairy in reaching all smallholders. Research is also needed to assess the competitiveness of Mother Dairy with the private sector, which has become more active since a partial decontrol of the dairy sector in the 1990s resulted in many private players entering the market and setting up milk processing facilities.

PPPs for Foot-and-Mouth Disease (FMD) Control in Brazil and Bordering Countries

FMD has been endemic in South America for over a century. While rarely fatal in mature livestock, FMD presents particular problems to export-oriented beef producers, given its rapid spread and the segmentation of world beef markets by a country's FMD status. In particular, price premiums exist for exporting countries that are free of FMD, with even higher prices available to those exporters that remain free of FMD without vaccination. As current technology limits the ability to distinguish between meat from an infected animal and one that has been vaccinated with the FMD vaccine, thus generating an immune response, risk-averse markets such as Japan and Korea pay a premium for meat from countries that are both FMD-free and that control the disease without vaccination. Such price incentives have made FMD control an attractive prospect in South America, although control efforts in exporting regions have been compromised by their own erratic budgetary support to veterinary services for surveillance and vaccine purposes and by the lax control efforts of poorer, smallholder-based neighbors (Rich, Winter-Nelson, and Brozovic 2005). Clearly, there is a need for intervention to address the market failures and externalities created by FMD. PPPs have a potential role in overcoming these externalities, given that the extensive and disparate nature of livestock production in South America makes it difficult (and expensive) for public or private solutions alone to sustainably control FMD.

In recent years, Brazil has become the world's largest beef exporter. Brazil's emergence in international beef markets has provided it with significant incentives to eradicate FMD, given the aforementioned segmentation of export markets based on FMD status. Following the major outbreak in 2000, Brazil eliminated FMD through vaccination in 15 states, comprising 84 percent of its cattle herd, and set a target date of 2006 to be entirely FMD-free (USDA-FAS 2005). Much of this success has been attributed to successful PPPs in animal health programs and to an ambitious traceability program, known as SISBOV, to identify and certify all cattle born in or imported into Brazil (Dubois and Moura 2004).

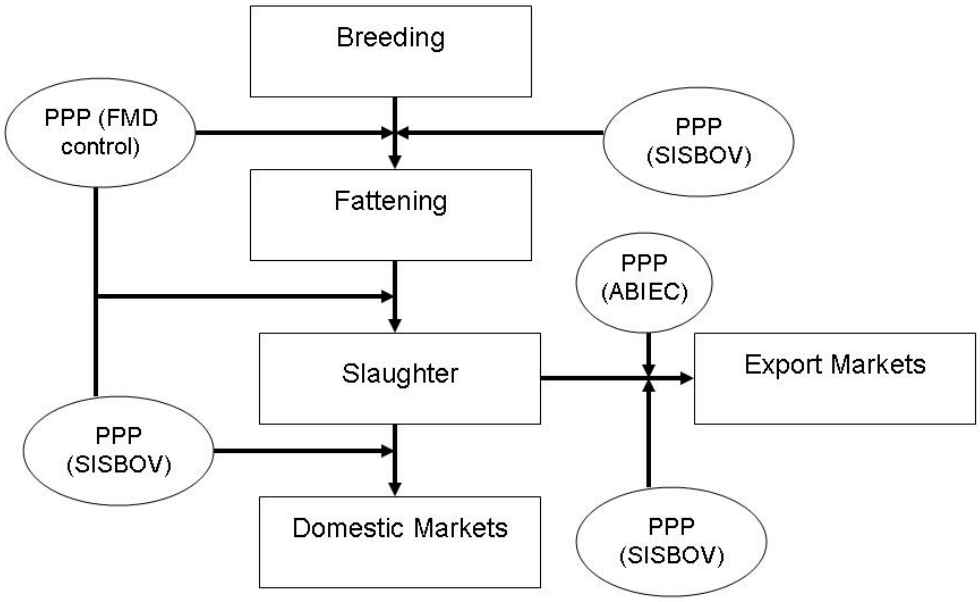
However, in October 2005, an outbreak of FMD was reported in Mato Grosso du Sul, home to more than 24 million head of cattle. Subsequent outbreaks were found in the state of Paraná. While eradication efforts are ongoing, the World Animal Health Organization (or OIE, by its French acronym) stripped several Brazilian states of their FMD-free-with-vaccination status, and more than 50 markets have banned Brazilian beef exports. Export losses were estimated to exceed $1 billion.

The conceptual model presented in this paper hypothesizes that successful supply chain partnerships must create benefits that are transmitted upstream and downstream for all members of the supply chain. From this perspective, the root cause of Brazil's failure to control FMD at this time through PPPs would lie in the limited disbursement of benefits of FMD control throughout the supply chain (requirements 4 and 5). A detailed examination of the structure of this supply chain and these partnerships in the following sections highlights this phenomenon, as well as other limitations of Brazil's PPP model.

The Supply Chain Structure

A simplified supply chain for beef production in Brazil is presented in Figure 6, including the PPPs existing in the sector. Similar to much of South America, livestock production in Brazil is of an extensive nature, with cattle reared and fattened on large ranches. Marketed cattle are typically sold at auction, from where they are sent to finishing yards and then to slaughterhouses. At each step of the supply chain, various types of support services are provided to producers through PPPs, including extension support for FMD control, traceability programs, and market promotion activities. First, the disbursement of vaccines and provision of vaccination for cattle in Brazil is a collaborative effort between the public (federal and state) and private sectors, with different responsibilities allotted to each party. The federal government is specifically tasked with the maintenance of surveillance and disease information systems, quality control for vaccines, tracking of animal movements, and diagnostic and laboratory facilities. State governments are in charge of inspection services (animals and vaccination services), local surveillance, and monitoring of local movements. The private sector is in charge of the actual administration of vaccinations, coordination with public bodies, and emergency health actions as needed (Dubois and Moura 2004). All parties are jointly responsible for promoting animal health education and vigilance activities among farmers. In certain states, the private sector manages a compensation payment program in the event of a disease outbreak to induce better control practices among farmers (Delgado, Narrod, and Tiongco 2008).

Figure 6. A simplified supply chain for beef in Brazil



Source: Developed by the authors, based on Dubois and Moura 2004.
Notes: PPP refers to public–private partnerships, FMD is foot-and-mouth disease, SISBOV is the Brazilian Identification and Certification System of Bovine and Bubaline Origin, and ABIEC is the Brazilian Beef Industries Export Association.

Likewise, the traceability system for export-destined beef is designed to be a joint public–private venture. The SISBOV program began in 2002 to trace the birthplace, production system, movements, vaccination details, sales, and slaughter of all cattle either born in Brazil or imported from foreign countries. SISBOV is implemented through 30 private agencies that have each been certified by the Ministry of Agriculture, Livestock, and Food Supply (USDA-FAS 2005). The SISBOV program is being gradually scaled up in a phased manner; by the end of 2007, all beef produced in Brazil was to fall under

the SISBOV program. The cost of the program is funded through a US$2.50 fee per animal and is expected to cost US$400 million once fully implemented (USDA-FAS 2002, 2003)

Finally, additional PPPs are in place on the marketing side in export markets. Promotion activities are the purview of the Brazilian Beef Processors and Exporters Association (ABIEC), which engages in trade lobbying and marketing in overseas markets and works in conjunction with the export promotion agencies of the Ministry of Agriculture (USDA-FAS 2005).

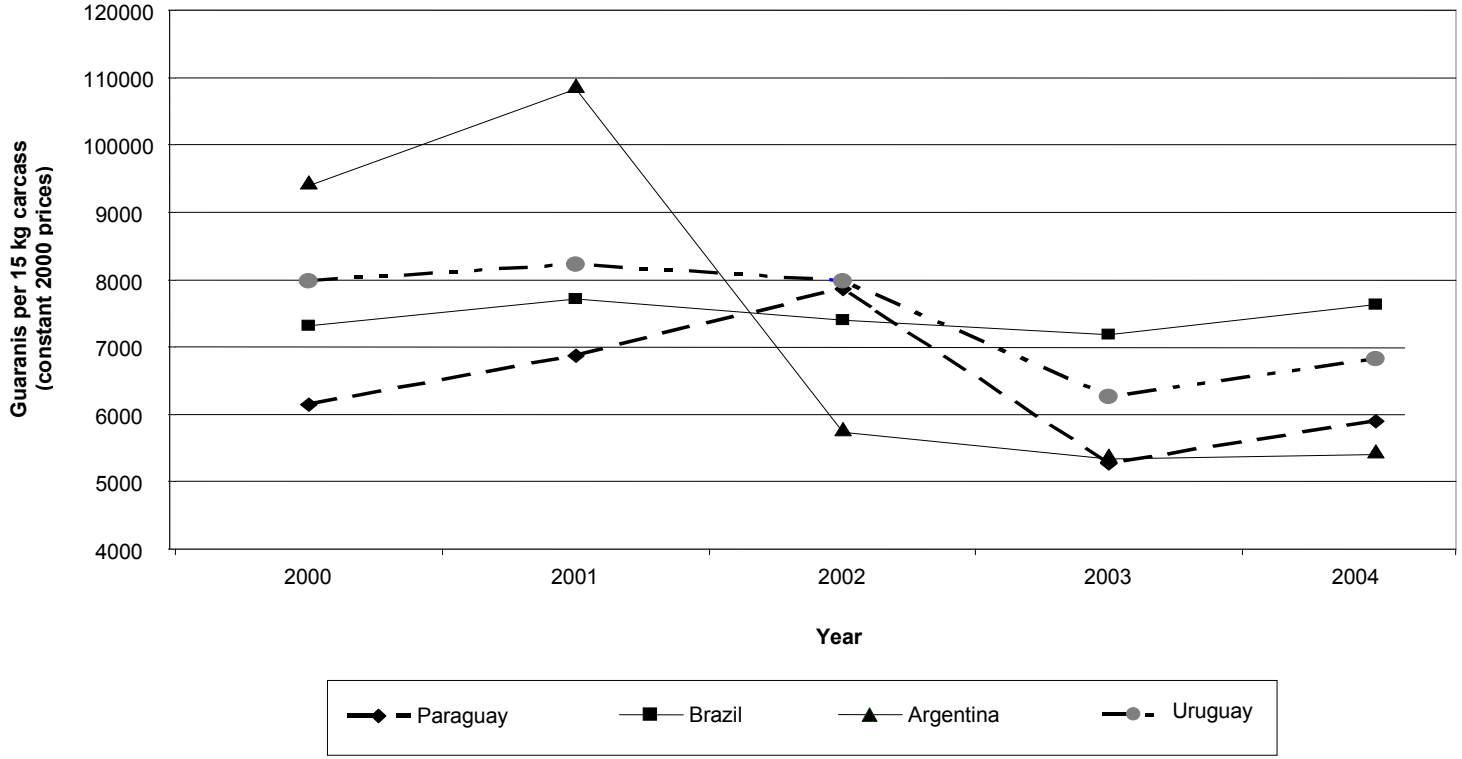
Problems of the Brazil PPP Model in FMD Control

The supply chain and supporting PPPs in Figure 6 are a prima facie example of a coordinated sector that has successfully managed the externalities caused by FMD. Indeed, in their profile on the partnerships in the beef industry in Brazil, Dubois and Moura (2004) laud it as such: "Thanks to the active participation of producers and all members of the supply chain in efforts to eradicate FMD, Brazil has been able to hoist itself to the position of leading producer of beef in the world." But less than two years later, Brazil was reeling from an FMD outbreak that has impacted exports to two of its largest markets (the E.U. and Russia) and limited exports to dozens of other countries. What happened?

First, the supply chain in Figure 6 is much more complicated, particularly due to the presence of other channels that interact with the supply chain in Brazil. In particular, Brazil, like other countries in the Mercosur region, receives (often illegal) imports of cattle from Paraguay, a country in which FMD control has been problematic. While information on the import of cattle from Paraguay is generally anecdotal, press reports from the 2005 outbreak suggest that the disease may have entered through cattle imported from Paraguay.[3] Indeed, an examination of price differentials between Paraguay and its Mercosur neighbors reveals significant incentives for moving cattle from Paraguay to Brazil during 2003–04 in particular (Figure 7). It should also be noted that price differentials between Paraguay and Argentina/Uruguay were high prior to the FMD outbreaks in those countries in 2001.

[3] See "Brazil State Suspects Foot-and-Mouth Came From Paraguay," CattleNetwork.com, October, 14, 2005. Retrieved at http://www.cattlenetwork.com/content.asp?contentid=11533.

Figure 7. Prices for live animals in Mercosur countries, 2000–04



Sources: Computed from data of Instituto FNP and USDA.

Partnerships that bring chain-wide benefits to the beef sector would clearly need to address this negative externality from Paraguay, particularly since as a larger supply chain, PPPs developed in Brazil would ideally need to induce positive spillovers downstream in Paraguay (requirements 4 and 5). Brazil has recognized this as a problem and has been at the forefront of regional efforts to eliminate disease in neighboring countries in South America. For instance, in 2004, Brazil donated 1 million doses of FMD vaccine to Bolivia and 500,000 doses to Paraguay to assist with regional efforts to fight FMD. However, sustainable disease control requires concerted efforts to finance and maintain surveillance programs over time. As the model shows, the benefits of the partnership for both the public and private sectors must exceed their costs over a long time period (requirements 2 and 3). Correa Melo and Saraiva (2003) note that the experience in South America with FMD eradication efforts has been a reduction in public and private commitments to disease control once the program has reached a certain threshold of success. Table 3 illustrates expenditures on animal health in Brazil during 1993–2002 and highlights this phenomenon. While the private sector clearly plays an important role in funding disease mitigation programs, the table also shows a sharp reduction in the level of public commitment to disease control in 2002 after a sharp increase during the late 1990s and early 2000s. Moreover, total commitments by both the public and private sectors fell in 2002, casting some doubts on the long-term perspectives of such partnerships. Press reports from 2004 and 2005 reveal further sharp reductions in animal health budgets in Brazil. For example, the *Irish Farmers Journal* found that the 2004 budget for animal health in Brazil of US$18 million was just one-half the level of the previous year. Likewise, CattleNetwork.com reported that only 12 percent of the 2005 budget allocated to animal health was spent prior to the October 2005 outbreak, while the BBC noted that US$1.5 million had been withheld from the 2005 budget earmarked for combating animal diseases.[4] Given the importance of the public sector in areas such as surveillance, reductions in funds by the public sector could have put the effectiveness of existing PPPs in jeopardy.

Table 3. Expenditures on animal health by the public and private sectors in Brazil, 1992–2003

	Expenditure on animal health (US$million)					Share of expenditure by source		
Year	Federal government	State government	Total public sector	Private sector	Total expenditure	Federal government	State government	Private sector
1992	7.665	2.666	10.331	74.651	84.982	9%	3%	88%
1993	7.292	1.013	8.305	75.883	84.188	9%	1%	90%
1994	23.068	3.009	26.077	94.09	120.167	19%	3%	78%
1995	39.033	9.981	49.014	143.034	192.048	20%	5%	74%
1996	18.845	23.036	41.881	90.13	132.011	14%	17%	68%
1997	26.567	20.289	46.856	120.518	167.374	16%	12%	72%
1998	23.214	16.831	40.045	98.94	138.985	17%	12%	71%
1999	31.699	22.61	54.309	96.25	150.559	21%	15%	64%
2000	52.741	19.579	72.32	124.268	196.588	27%	10%	63%
2001	53.869	18.494	72.363	113.292	185.655	29%	10%	61%
2002	17.581	17.016	34.597	113.371	147.968	12%	11%	77%

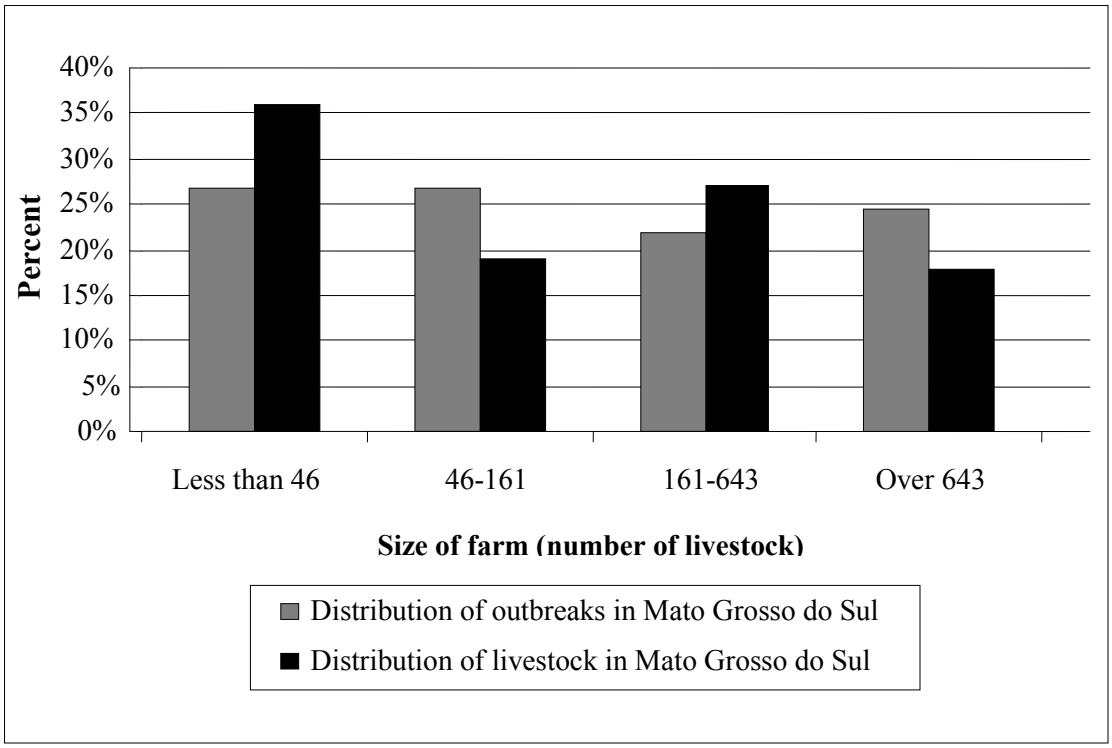
Source: Dubois and Moura 2004.

Finally, our model hypothesizes that PPPs need to provide benefits to their targeted beneficiary (requirement 1). While large, export-oriented farms would be the main beneficiary of FMD control policies, such PPPs also need to be as inclusive as possible and incorporate smallholders, given that the disease control efforts of smallholders are pivotal for arresting disease in a country as a whole.

[4] See Gartlan 2004; CattleNetwork.com 2005; Kingstone 2005.

Consequently, incentives need to be provided to smallholders to enable them to become active partners in such programs (Rich, Winter-Nelson, and Brozovic 2005). However, partnerships such as SISBOV have run into problems recently due to conflicts among producers, meat packers, and the government over tracing animals back to the farm or on an individual basis (USDA-FAS 2005). In the case of the last outbreak, an examination of the pattern of the 2005–06 outbreaks reveals that farms with fewer than 46 head of livestock accounted for nearly 27 percent of the outbreaks, which is slightly below the average distribution of cattle holdings in Mato Grosso do Sul that prevailed in 1996 (37 percent, see Figure 8). Indeed, it appears that outbreaks were more prevalent among medium-scale producers (46–161 heads), who, like smallholders, nevertheless represent an important constituency in ensuring successful FMD control efforts.

Figure 8. Distribution of farms affected by foot-and-mouth disease in Brazil, 2005-06, compared with statewide distribution (1996)



Source: Derived from data in ABIEC 2006; 1996 Agricultural Census.

The lesson from this case is that while PPPs have been partially successful in reducing FMD in Brazil, future programs need to create partnership mechanisms that address more areas of the supply chain and that can be sustained over time. Correa Melo and Saraiva (2003) conclude that sustainable partnerships require funding sources that do not rely on the public sector, such as those acquired from fees on livestock sales. At the same time, any funding, management, or organizational mechanism to eradicate FMD should be sensitive to the constraints of smallholders (both in Brazil and in neighboring countries), whose cooperation in disease control is fundamental to success.

7. CONCLUSIONS AND FUTURE DIRECTIONS

Market failures are unfortunately a major component of agriculture in developing countries. The transition of agriculture toward high-value commodities presents new challenges for producers, particularly smallholders, who wish to access these new supply chains. Public and private institutions are themselves often incapable of overcoming these market failures for smallholders, implying the need to examine new modalities for assisting the poor.

In this paper, we examined how public–private partnerships (PPPs) that combine the strengths of each sector and that utilize integrated interventions at different points in the supply chain can serve as a major force for smallholder integration into commercialized agriculture. By strengthening linkages across supply chain actors, PPPs can create chain-level solutions to conventional market failures. According to the conceptual model, the benefits of PPPs must be transmitted at the chain level and must induce benefits for all participants. While the case study examples showed the means by which the poor have been integrated into formal markets through such partnerships, chain partnerships can in some cases bypass smallholders under the guise of chain-wide efficiency. However, the FMD case in Brazil revealed that ignoring smallholder production systems puts the gains of the PPPs in jeopardy. Additional work is required to determine ways to develop modalities with chain actors to integrate smallholders through such partnerships.

The FMD case showed that PPPs can fail when they do not consider all elements of the supply chain and/or when mechanisms to ensure their long-term viability are not established. The sustainability of PPPs in supply chains clearly needs further elaboration in future research. In particular, it is unclear how partnerships would evolve in the face of rising competition, either domestic or global, and whether they could lead to opportunities for smallholders to upgrade and innovate supply chains. A dynamic perspective is necessary to assess these considerations.

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